

Division of Plant Operations.

ONTARIO MINISTRY OF ENVIRONMENT



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1971

OPERATING
SUMMARY

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CHATHAM

WATER POLLUTION CONTROL PLANT

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1971

Chatham : water pollution
control plant.

81495

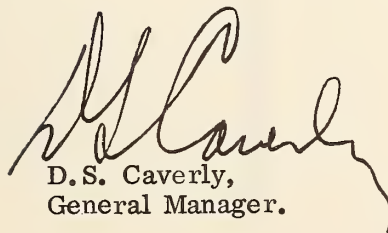



Water management in Ontario

Ontario
Water Resources
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.


D.S. Caverly,
General Manager.


D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.



Environment Ontario

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135 St. Clair Avenue West
Toronto 195

CHATHAM
WATER POLLUTION CONTROL PLANT

operated for

THE CITY OF CHATHAM

by the

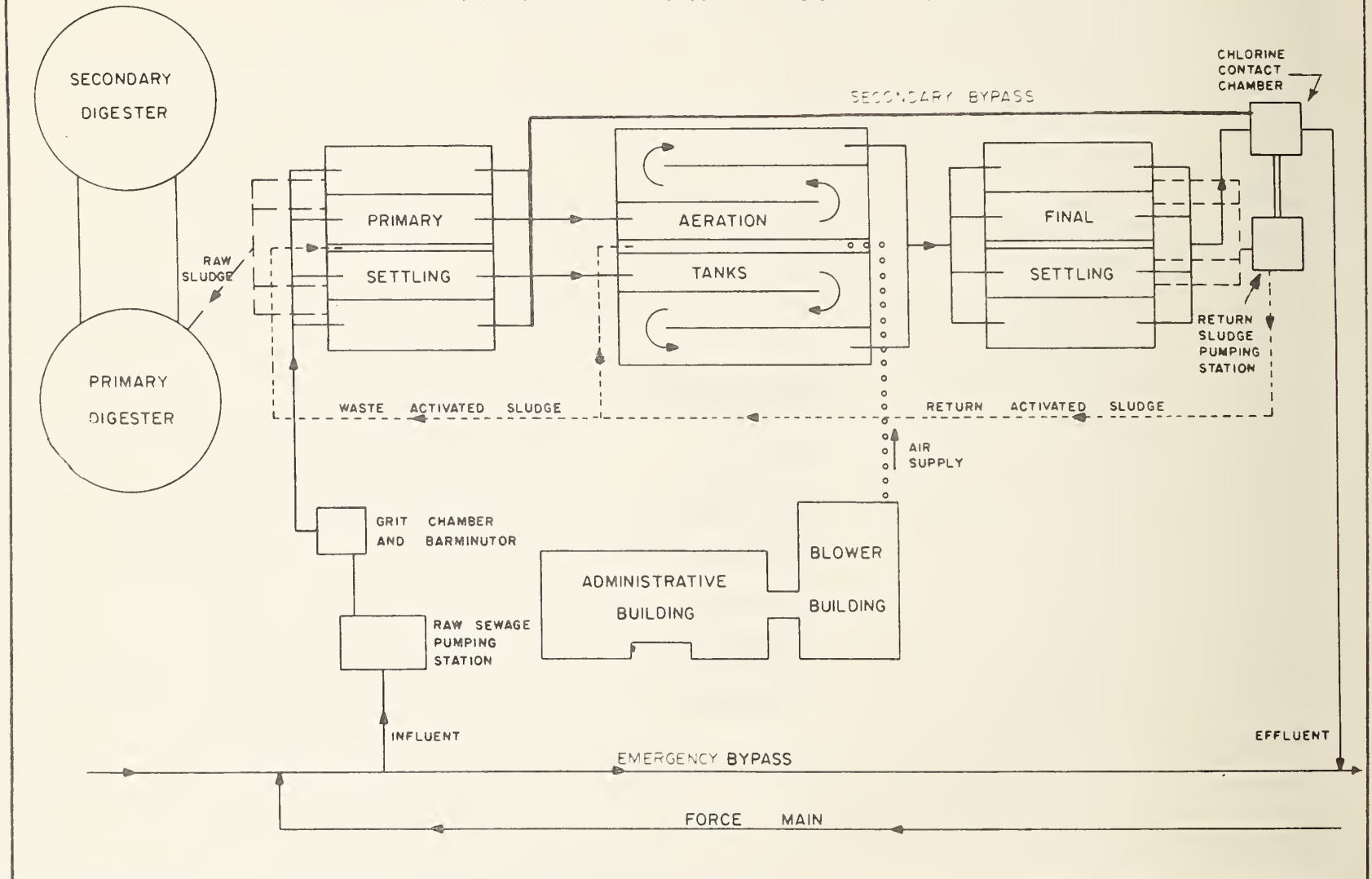
ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY

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CHATHAM WPCP FLOW CHART



DESIGN DATA

PROJECT NO. 2-0102-62

TREATMENT Activated Sludge

DESIGN FLOW 4.5 mgd

DESIGN POPULATION 45,000

BOD - Raw Sewage 250 mg/l
- Removal 90%

SS - Raw Sewage 250 mg/l
- Removal 90%

RAW SEWAGE

Screening

- One manually-cleaned bar screen

Pumps

Type: Worthington
Size: Three 3750 gpm @ 47' tdh
One 3750 gpm @ 47' tdh
(electric & standby diesel)

PRIMARY TREATMENT

Grit Removal

Type: Aerated, with clamshell bucket
Size: One 27' x 14' x 11 2/3 (avg)
(27,450 gal)
Retention: 8.8 min
Air Supply: One Sutorbilt

Comminution

Type: Barminutor
Size: Two model C

Primary Sedimentation

Type: Jeffrey, two-pass
Size: Two 80' x 32' x 12' (avg)
(382,000 gal)
Retention: 2.05 hr
Loading: Surface, 878 gal/ft²/day
Weir, 9400 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; triple pass
Size: Two 130' x 63' x 14'
(1.43 mil gal)
Retention: 7.6 hr

Diffusers

Type: Schumacher tubes
125 per pass on 12" centres

Air Supply

Type: Sutorbilt
Size: Three 2500 cfm

Secondary Sedimentation

Type: Jeffrey
Size: Two 120' x 32' x 12' (avg)
(574,000 gal)
Retention: 3.08 hours
Loading: Surface, 586 gal/ft²/day
Weir, 8780 gal/ft/day

CHLORINATION

Type: F & P
Size: One 2000 lb/day
One 400 lb/day

Chlorine Contact Chamber

Size: One 33.6' x 30' x 10' (62,300 gal)
Retention: 22 min

OUTFALL

- 1,025' to Thames River

SLUDGE HANDLING

Digestion System - Two-stage
Primary--

Type: Gas mixed, fixed cover
Size: One 65' dia x 25' (83,000 cu ft
or 0.52 mil gal)

Secondary--

Type: Fixed cover
Size: One 65' dia x 25' (82,000 cu ft
or 0.51 mil gal)

'71 Review

GENERAL

This project consists of a sewage treatment plant, sewage pumping stations and a sewer system. The plant employs the activated sludge process with 2 stage anaerobic sludge digestion, and is designed for a hydraulic loading of 4.5 mgd and an organic loading of 11,250 pounds of BOD per day. Fourteen pumping stations, 2 of them located on the plant site, are operated by plant staff. Of the 14 stations, 2 are storm water stations and 3 are sewage stations, owned by the City and operated by the Commission.

The plant occupies 6 acres of a 76 acre plot in the west end of Chatham, downstream and upwind of the City. A total of 34.5 acres have been used to build a 6 cell aerated lagoon designed for the treatment of canning wastes.

EXPENDITURES

The operating cost for the complete project for 1971 was \$193,158.61 which represents a considerable increase over 1970. Costs rose mainly due to increases in salaries and sludge haulage. Based on the analyses of raw sewage entering the plant, the cost per million gallons of sewage treated was \$159.00 and the cost per pound of BOD removed was 8.74 cents. However, the waste water from bean processing at Libby Mc Neil and Libby Limited was introduced into the treatment plant in a way that precluded monitoring the additional hydraulic and organic loading (estimated at 32,500 gallons per day and 975 pounds BOD per day respectively). Taking the estimated bean wastes loadings into consideration the cost per million gallons of sewage treated becomes \$158.00 and the cost per pound of BOD removed becomes 7.52 cents. These figures are still substantially higher than those for 1970. The difference is due not only to the increased operating costs but also to a drop in the total amount of sewage treated and in the BOD concentration in the raw sewage.

PLANT FLOWS and CHLORINATION

The total gallonage treated in 1971 was 1214 million gallons. The plant operated at 74 percent of hydraulic capacity over the year, at 111 percent during the peak month and at 196 percent during the peak day. During the spring, at times of heavy rains, flows in excess of the secondary treatment capacity received only primary treatment. A review of daily flow records indicates that bypassing of secondary treatment should have occurred on approximately 75 days in 1971.

During August and September approximately 1 mgd of waste from canning factories was treated in the plant with the remaining cannery waste processed in the aerated lagoons.

From the flow probability graph, it can be seen that during 1971 the design hydraulic capacity of the plant was exceeded about 17 percent of the time.

The final effluent was chlorinated from May through October. A total of 34,000 pounds of chlorine was used at an average dosage of 5.6 milligrams per litre to retain a residual of 0.5 mg/l in the final effluent.

PLANT EFFICIENCY

Based on available sampling data, the average BOD and suspended solids concentrations in the raw sewage were 210 mg/l and 268 mg/l respectively. Final effluent BOD and suspended solids concentrations averaged 15 mg/l and 14 mg/l respectively, which represent BOD and suspended solids reductions of 93 percent and 95 percent. Taking into account the estimated bean waste loading, the BOD reduction would increase to about 94 percent while the suspended solids reduction would be essentially the same.

The final effluent BOD and suspended solids concentrations met the OWRC objectives approximately 62 percent and 73 percent of the time. The deterioration of effluent quality was particularly evident towards the latter part of 1971. Disruption of the activated sludge process by industrial wastes is believed to be the main reason for the deterioration. During August to October a large portion of the tomato canning waste was treated in the plant rather than in the aerated lagoon. The associated flows resulted in hydraulic overloading of the clarifiers and the frequent high pH of the waste interfered with the microbial activity in the aeration tanks. An acid spill from another of the City's industries on October 5th resulted in a serious destruction of the microbes in the aeration tank and necessitated bypassing of the secondary portion of the plant. Another problem that plagued operation of the plant was the mechanical failures experienced with one of the 3 air blowers. Full aeration capacity was not available for several months. Although the infiltration of storm water into the sewer system has been reduced, this problem continued to hinder operation of the plant, and necessitated giving part of the sewage only primary treatment.

A total of 2470 cubic feet of grit was removed. This represents a removal of 2.03 cubic feet per million gallons which is normal for this type of plant. It should be noted however that the large increase in February and December is due to infiltration and the large increase in August through October is due to tomato seeds.

SLUDGE DIGESTION and DISPOSAL

A total of 10.4 million gallons of raw sludge was pumped to the digesters and 5.97 million gallons of digested sludge removed representing a 57.5 percent reduction in sludge volume. The increase in digested sludge production over previous years is believed due to the deterioration in performance of the primary digester. The gradual accumulation of grit in this tank has apparently reduced its useable volume to the extent that its ability to degrade the raw sludge has been seriously affected. A cleanout of this tank is scheduled for 1972.

Ultimate disposal of the digested sludge was carried out by dumping at a sanitary land fill site in Harwich Township.

AERATION

The average BOD entering the aeration section was 107 mg/l and the average MLSS was 1790 mg/l, resulting in an average loading of .14 pounds of BOD per day per pound of MLSS. An average of 2110 cubic feet of air was supplied per pound of BOD removed (taking into account the estimated bean waste loadings).

CONCLUSIONS

During 1971 the flow of raw sewage to the plant was reduced significantly. This is believed due to the City's continued progress towards complete separation of its storm and sanitary sewer systems. Further progress will postpone the necessity of expanding the hydraulic capacity of the plant, and enable complete treatment of all the City's sewage.

There was a deterioration of the quality of the final effluent particularly towards the latter part of 1971. The deterioration was due to disruption of the activated sludge process by industrial wastes, mechanical problems with the plant's air blowers, and storm water infiltration into the sewer system.

Despite the efforts by Libby, McNeil and Libby Limited and the OWRC, the odour problems associated with the waste water from Libby's bean processing, were not solved. Efforts will be continued in 1972.

Full scale phosphorus removal studies were initiated in October using waste pickle liquor from Ontario Steel Products Limited. The preliminary results were sufficiently encouraging to warrant continuation of the studies in 1972.

PROJECT COSTS

STAGE I - 2-0102-62

NET CAPITAL COST (Final) \$2,615,831.27

DEDUCT - Portion financed by
CMHC/MDLB (Final) 1,845,135.13

Long Term Debt to OWRC \$ 770,696.14

Debt Retirement Balance at Credit
(Sinking Fund) December 31, 1971 \$ 122,901.63

Net Operating \$ 193,158.61
Debt Retirement 8,577.00
Reserve 5,651.63
Interest Charged 43,228.99

TOTAL \$ 250,616.23

RESERVE ACCOUNT

Balance @ January 1, 1971 \$ 35,305.57

Deposited by Municipality 5,651.63

Interest Earned 2,422.58

\$ 39,749.57

Less Expenditures 3,430.25

Balance @ December 31, 1971 \$ 39,749.53

PROJECT COSTS

STAGE II - 2-0102-62

NET CAPITAL COST (Final)	\$813,322.12
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DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>504,317.16</u>
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Long Term Debt to OWRC	<u>\$309,004.96</u>
------------------------	---------------------

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	\$ <u>40,165.21</u>
---	---------------------

Net Operating	\$ -
Debt Retirement	3,678.00
Reserve	2,236.20
Interest Charged	<u>17,332.35</u>

TOTAL	\$ <u>23,246.55</u>
-------	---------------------

RESERVE ACCOUNT

Balance @ January 1, 1971	\$ 15,095.81
---------------------------	--------------

Deposited by Municipality	2,236.20
---------------------------	----------

Interest Earned	<u>1,030.98</u>
-----------------	-----------------

	\$ 18,362.99
--	--------------

Less Expenditures	<u>-</u>
-------------------	----------

Balance @ December 31, 1971	\$ <u>18,362.99</u>
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PROJECT COSTS

STAGE III - 2-0102-62

NET CAPITAL COST (Final)	\$1,079,015.80
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>733,301.54</u>
Long Term Debt to OWRC	\$ <u>345,714.26</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	\$ <u>40,419.94</u>
Net Operating	\$ -
Debt Retirement	4,430.00
Reserve	1,747.28
Interest Charged	<u>19,391.40</u>
TOTAL	\$ <u>25,568.68</u>

RESERVE ACCOUNT

Balance @ January 1, 1971	\$ 9,269.59
Deposited by Municipality	1,747.28
Interest Earned	<u>642.67</u>
	\$ 11,659.54
Less Expenditures	<u>-</u>
Balance @ December 31, 1971	\$ <u>11,659.54</u>

PROJECT COSTS

STAGE IV - 2-0102-62

NET CAPITAL COST (Final) \$593,292.79

DEDUCT - Portion financed by
CMHC/MDLB (Final) 357,876.24

Long Term Debt to OWRC \$235,416.55

Debt Retirement Balance at Credit
(Sinking Fund) December 31, 1971 \$ 18,984.47

Net Operating \$ -
Debt Retirement 3,311.00
Reserve 3,115.79
Interest Charged 13,204.71

TOTAL \$ 19,631.50

RESERVE ACCOUNT

Balance @ January 1, 1971 \$ 11,411.69

Deposited by Municipality 3,115.79

Interest Earned 816.08

\$ 15,343.56

Less Expenditures -

Balance @ December 31, 1971 \$ 15,343.56

PROJECT COSTS

SPECIAL OPERATING AGREEMENT - A

RESERVE ACCOUNT

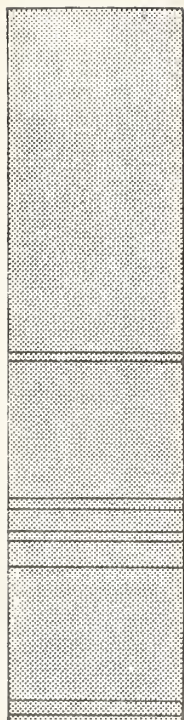
Balance @ January 1, 1971	\$1,529.02
Deposited by Municipality	278.78
Interest Earned	<u>105.82</u>
	\$1,913.62
Less Expenditures	<u>-</u>
Balance @ December 31, 1971	<u><u>\$1,913.62</u></u>

PROJECT COSTS

SPECIAL OPERATING AGREEMENT - B

RESERVE ACCOUNT

Balance @ January 1, 1971	\$549.60
Deposited by Municipality	379.40
Interest Earned	<u>45.26</u>
	\$974.26
Less Expenditures	<u>-</u>
Balance @ December 31, 1971	<u><u>\$974.26</u></u>



OPERATING COSTS

● PAYROLL	4 8 %
● FUEL	< 1 %
● POWER	1 9 %
● CHEMICALS	2 %
● GENERAL SUPPLIES	3 %
● EQUIPMENT	1 %
● REPAIRS & MAINTENANCE	3 %
● SUNDRY	2 0 %
● WATER	2 %
● TRAVEL	< 1 %

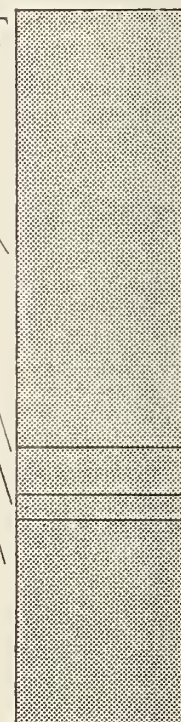
1971 COSTS

TOTAL ANNUAL COST

NET OPERATING	6 1 %	●
DEBT RETIREMENT	6 %	●
RESERVE	4 %	●
INTEREST	2 9 %	●

YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	¢ per lb BOD
1967	1130.2	\$124,134.09	\$107.93	4 cents
1968	1380.4	137,296.11	99.46	4 cents
1969	1494.0	149,745.68	100.23	4 cents
1970	1355.0	153,786.75	117.19	5 cents
1971	1214.4	193,158.61	159.10	8 cents



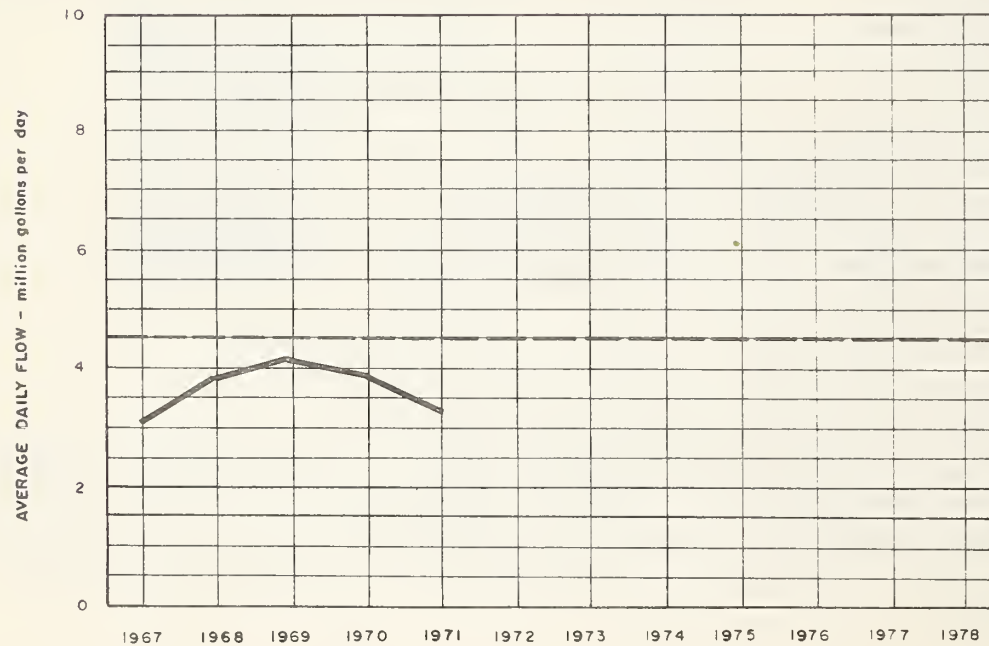
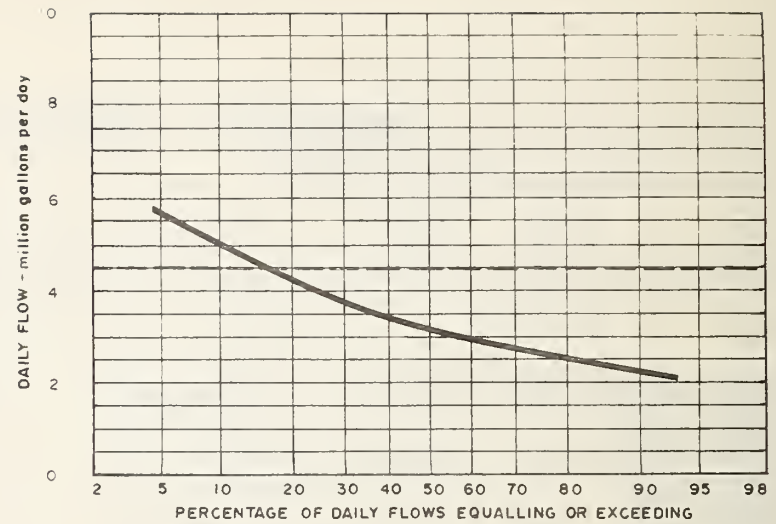
MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	6503.25	6360.10	-	29.80	-	-	48.35	-	23.63	41.37	-	-
FEB	16520.15	9044.63	653.48	53.35	2659.84	-	630.35	-	908.44	2386.51	16.21	167.34
MAR	15754.46	5259.37	694.36	69.01	2949.61	-	758.63	-	268.23	4962.98	695.86	96.41
APR	9364.57	5640.93	326.96	15.52	2879.64	-	123.69	64.32	216.23	69.40	-	27.88
MAY	17074.13	5852.90	1151.36	16.80	2816.96	-	536.32	-	97.88	5860.04	741.87	-
JUNE	13183.07	6603.02	(236.84)	95.01	2974.10	-	210.47	112.82	436.16	2988.33	-	-
JULY	11287.25	5997.38	903.12	29.80	2952.32	-	236.12	54.92	96.67	239.32	777.60	-
AUG	14290.63	6789.04	386.00	12.86	2512.86	2464.00	215.37	526.02	1242.10	142.38	-	-
SEPT	23915.52	6967.55	(81.44)	11.58	2986.86	-	205.23	166.68	482.45	12221.49	955.12	-
OCT	16377.28	11442.08	182.82	9.44	3707.55	179.20	10.30	-	738.09	107.80	-	-
NOV	18081.77	9104.96	548.46	73.64	3510.65	430.33	394.14	215.25	770.65	3033.69	-	-
DEC	30806.53	10290.01	263.84	413.13	6382.11	765.86	1820.54	941.99	1359.14	7286.14	1208.10	75.65
TOTAL	193158.61	89351.97	4792.12	829.94	36332.50	3839.39	5189.51	2082.00	6639.67	39339.45	4394.76	367.30

Brackets indicate credit.

* Sundry includes sludge haulage costs of \$34,644.99

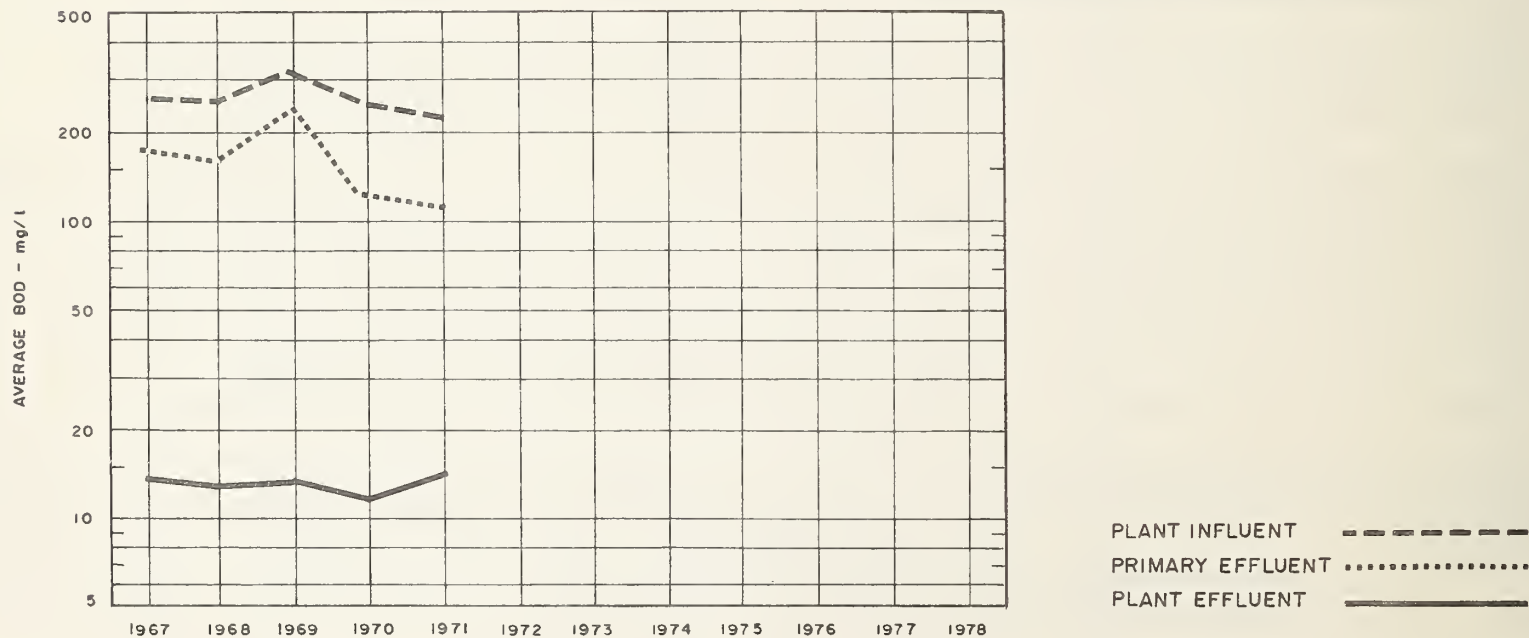
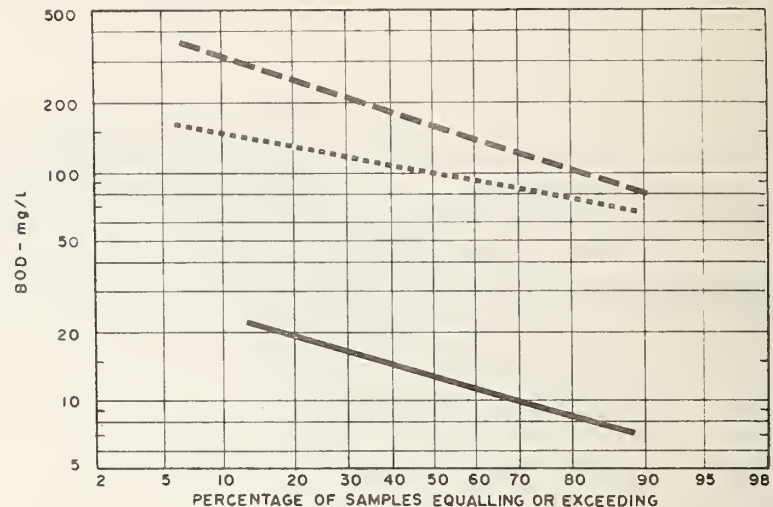
PROCESS DATA FLOWS



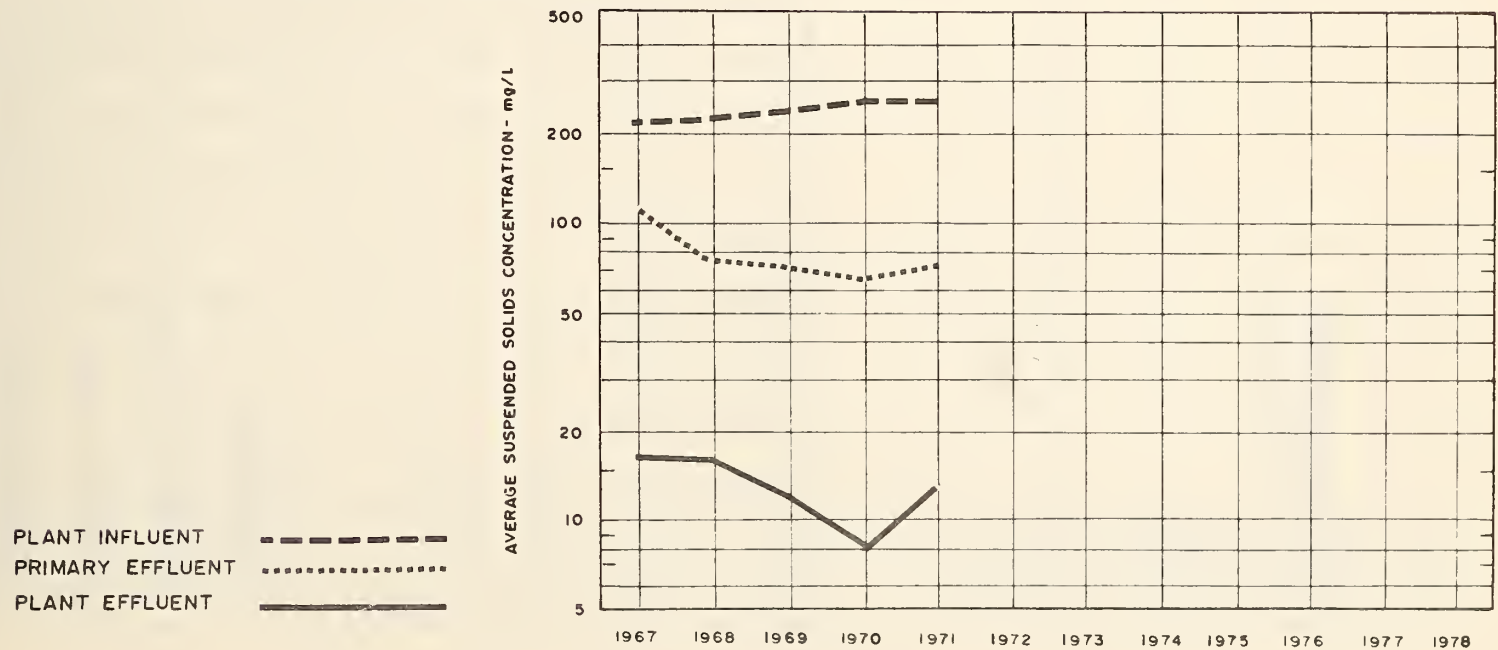
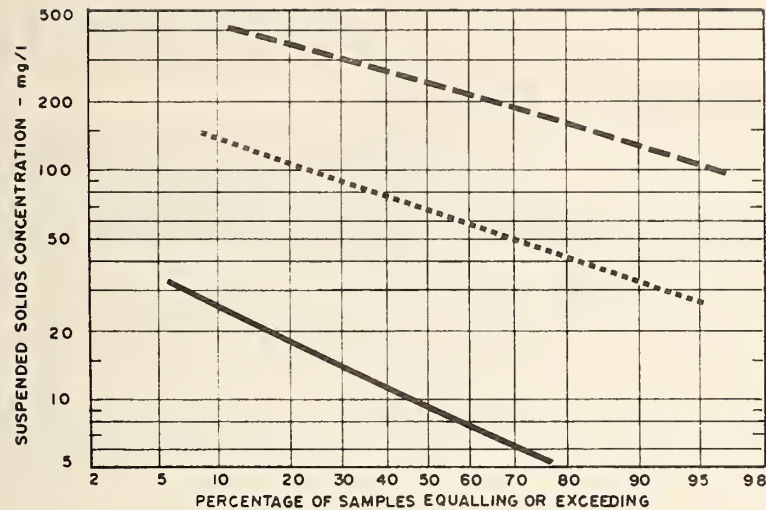
PLANT PERFORMANCE

MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	MAXIMUM RATE	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDU
	million gallons	mil gal	mil gal	mgd	mg/l	mg/l	%	10 ³ pounds	mg/l	mg/l	%	10 ³ pounds	mg/l as P	mg/l as P	%
JAN	80.7	2.60	4.2	10.6	297	9	97	232	316	5	98	251	14	5	64
FEB	93.1	3.33	8.8	16.4	205	15	93	177	206	8	96	184	17	8	53
MAR	94.4	3.04	5.2	10.6	272	20	93	238	240	15	94	212	14	6	57
APR	104.0	3.46	6.5	16.6	191	17	91	181	262	13	95	259	18	7	61
MAY	100.6	3.24	4.4	11.9	118	13	89	106	254	19	93	236	7	6	14
JUNE	89.5	2.98	4.5	12.1	150	18	88	118	216	14	94	181	-	-	-
JULY	86.1	2.78	8.8	12.4	363	9	98	305	387	3	99	331	19	9	53
AUG	119.4	3.86	7.9	17.6	129	11	92	141	267	5	98	313	6	5	17
SEPT	149.0	4.98	8.5	17.0	183	15	92	250	266	59	78	308	6	3	50
OCT	104.1	3.36	5.4	14.0	178	19	89	166	288	13	95	286	-	-	-
NOV	94.8	3.16	4.3	15.2	180	23	87	149	250	13	91	225	16	1	94
DEC	98.7	3.18	5.9	16.7	171	20	88	149	260	12	95	245	-	-	-
TOTAL	1214.4	-	-	-	-	-	-	2212	-	-	-	3031	-	-	-
AVG.	-	3.33	MAXIMUM 8.8	MAXIMUM 17.0	210	15	93	184	268	14	95	253	13	6	54
No. of Samples	-	-	-	-	78	77	-	-	206	211	-	-	9	9	-

BIOCHEMICAL OXYGEN DEMAND



SUSPENDED SOLIDS

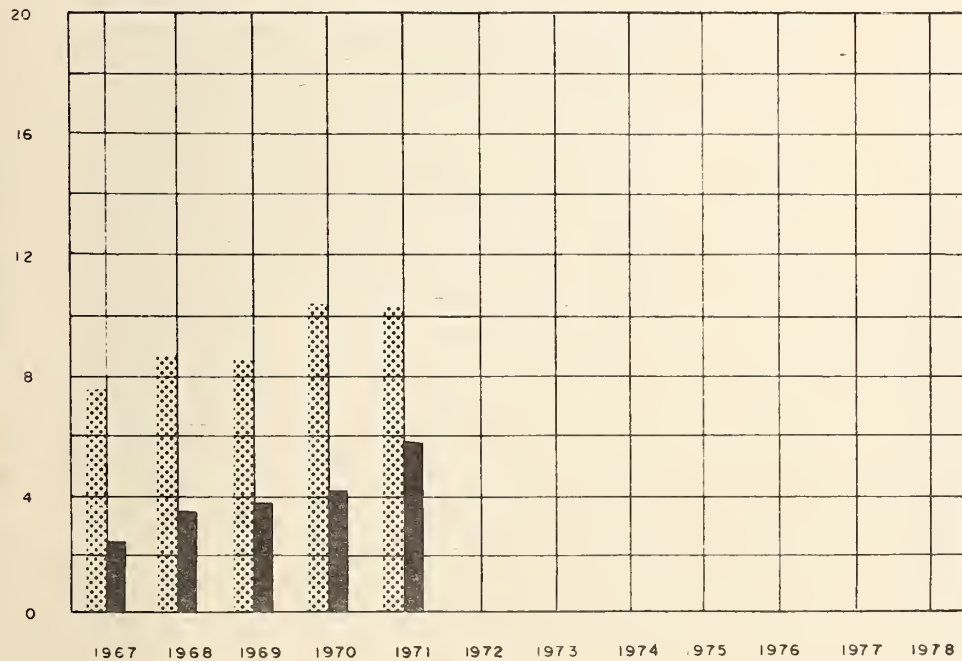
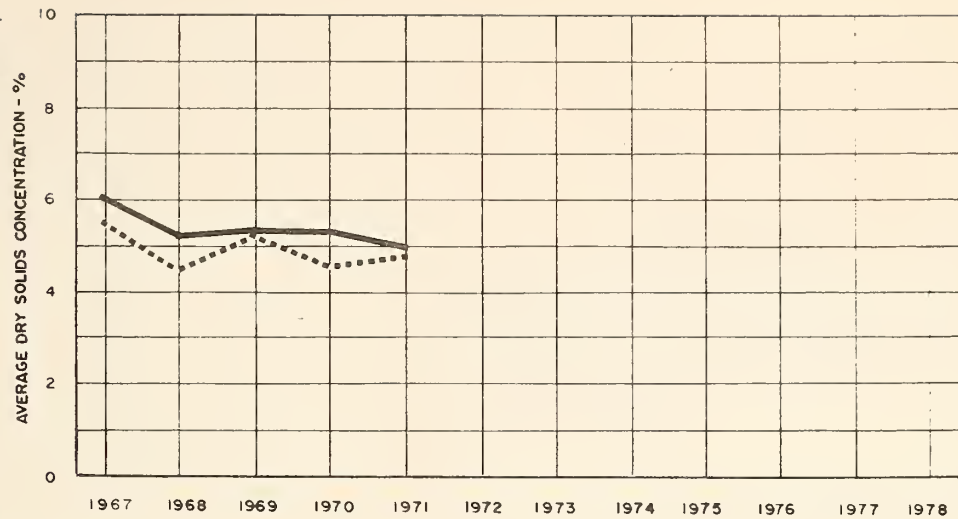


TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	CL ₂ USED 10 ³ pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day ⁻¹	AIR 1000 ft ³ lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	88	0	-	96	54	1540	.11	2.6	548	4.0	66	373	4.5	46	.9	2213
FEB	378	0	-	84	64	1760	.11	2.5	712	5.3	60	377	4.6	46		2222
MAR	140	0	-	84	54	1530	.11	3.1	910	5.9	65	454	4.6	42	.4	2692
APR	141	0	-	97	57	1880	.12	2.2	979	4.7	60	441	5.0	43	.5	2616
MAY	73	6.9	6.9	95	74	1940	.11	2.6	995	3.8	58	456	5.2	44	2.0	2710
JUNE	107	7.0	7.9	157	74	2440	.13	1.5	968	3.9	62	571	4.8	47	.8	3396
JULY	68	4.2	4.8	126	82	2050	.12	1.8	948	5.3	55	484	4.6	49	1.6	2878
AUG	194	5.0	4.2	98	104	1730	.15	1.7	773	5.4	51	474	4.9	45	2.3	2821
SEPT	493	5.8	3.9	130	134	1430	.31	1.3	725	6.9	47	577	5.8	41	.3	3422
OCT	270	5.1	5.0	110	111	1830	.14	2.9	716	4.7	51	513	7.6	39	-	3056
NOV	176	0	-	106	98	1920	.12	3.4	760	4.2	51	533	4.7	41	-	3175
DEC	342	0	-	116	110	1470	.18	1.9	1565	4.4	48	716	4.7	40	-	4143
TOTAL	2470	34.0	-	-	-	-	-	-	10417	-	-	5969	-	-	-	35344
AVG.	2.0 cu. ft/mil gal	5.7	5.6	107	78	1790	.14	2.4	868	4.9	56	497	5.0	44	1.1	2945

DIGESTION

RAW SLUDGE
DIGESTED SLUDGE ———



RAW SLUDGE TO DIGESTER

DIGESTED SLUDGE REMOVED

Date Loaned

Ontario Water Resources Commission
Division of Plant Operations.

TD227/C43/W38/1971/moe
Chatham - Water Pollution Control
Plant: 1971

DATE	ISSUED TO
	C.I. ASJS

TD227/C43/W38/1971/MOE
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pollution control asjs
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Chatham : water pollution
control plant.
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